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The cell membrane consists of chitin with a very small amount of cellulose and pectin. In the heterocysts, however, a layer of cellulose is laid down when it (the heterocyst) begins to develop. In those genera with sheaths the filaments lie free in the sheath except the heterocysts, which are grown fast to it. Kohl sees in this the explanation of the function of these cells. They serve as points of resistance in the formation of hormogones, and in the branching of the filament. What the function can be in the forms without a sheath he does not clearly explain. They are evidently, however, not reserve cells, for they originate by the formation of stoppers for the pores through which alone the adjacent cells could furnish or receive reserve stuffs. They then build the cellulose wall and totally degenerate.

Here and there in the filament a single cell or several cells soften and degenerate, forming the points at which the filament breaks when it divides or produces hormogones. In the forms with false branching such degenerated cells are formed below the heterocysts and seem to help soften the sheath wall so as to enable the filament to turn out through the sheath when the resistance of the fast-grown heterocyst prevents its growing further in a straight line.

Normally the cells have no cell-sap vacuoles. They resemble meristematic cells in the size of the nucleus and density of the cytoplasm. Only in old or terminal cells and in the heterocysts do such vacuoles occur. The so-called gas vacuoles that Kohl mentions as occurring in some Cyanophyceæ have been proved definitely by Molisch and Brand, working independently, to be not of gas nature.

All cells are connected by a fine thread of plasm, which penetrates the center of the pore in the cell wall; even in the heterocysts where the pore is filled up the plasma thread remains, but it is unable to convey enough foodstuffs to keep the heterocyst plasma in good condition.

The nuclear division was made the object of especial study. By staining the living cells with methylene-blue Kohl was able to follow the process without subjecting himself to the criticism that his chromosomes were artefacts. The nucleus consists of a ground mass and a difficultly visible fine chromatin-bearing filament. This thickens itself and finally forms a spirem. This breaks up into usually six straight chromosomes which arrange themselves parallel to the long axis of the thread. They then begin to bow in somewhat, until they are much farther apart terminally than centrally. They then divide *crosswise* in the middle, *not lengthwise,* and collect at each end of the cell. At this point in the division a few achromatic fibers are visible, connecting the two masses of chromosomes, but no spindle in the proper sense is seen. The daughter chromosomes arrange themselves parallel, then form a spirem. As the chromosomes divide, the body of the nucleus which retains its distinctness from the cytoplasm begins to pinch in at the middle, and soon the separation of the two nuclei is complete. A cell wall separates the new cells at once.

The author also discusses the relationship of the Cyanophyceæ to the bacteria, holding that they are closely related and that the latter too probably have a nucleus similar to that described.

The book is, unfortunately, marred by an excessive number of typographical errors. The ten plates illustrating the book are finely executed and are very helpful to the understanding of the subject.

ERNEST A. BESSEY.

Geology of Economic Non-metallic Minerals. By FRANCIS MIRON, C. E.*

This little volume is published as one part of the 'Encyclopédie Scientifique des Aide-Mémoire,' issued under the direction of M. Léauté, member of the Institute of France. It is the fourth by the same author, the preceding volumes having dealt respectively with: (1) Mineral oils, (2) subterranean waters and (3) metallic minerals and mining. The general object is to furnish a series of brief hand-books describing the geological distribution, manner of occurrence and methods of procuring and utilizing of the substances treated of in each of the volumes. The pres-

* 'Gisements Mineraux; Stratigraphic et Composition,' par François Miron, Paris, Masson et Cie, pp. 157. (Part of 'Encyclopédie Scientifique des Aide-Mémoire.')

ent one deals with economic minerals strictly, exclusive of metallic ores, and in the main of precious and ornamental stones.

The plan of the work is good, and the geological element in it is valuable; but the treatment is very unequal, some portions being well and fully presented, and others but inadequately. The work bears no date, and takes no note of some important recent developments, *e. g.,* that of monazite and the related rare earths. Its chemical formulas, too, are not modern. As a whole, the book is of interest in its suggestion of what might be, if the author's ideas were carried out more fully and comprehensively, errors and omissions corrected, and the treatment brought up to date.

G. F. K.

SOCIETIES AND ACADEMIES.

ONONDAGA ACADEMY OF SCIENCE.

At the October meeting of the academy, held in the Syracuse high school building, Dr. T. C. Hopkins presented an illustrated paper on the glaciers of Switzerland and Austria. The paper was based on field studies in the Alps during the past summer. It illustrated many features of the Alpine glaciers such as the snow fields, aiguilles, crevasses, moraines, gorges and the marked recession of many of the glaciers in recent years.

At the November meeting of the academy, held in the historical society rooms there were three papers on biological subjects:

1. *Diseases of Cultivated Flowering Plants:* George T. Hargitt.

The diseases were classified, according to the function disturbed, into three classes:

(*a*) *Disturbed Photosynthesis.*—The rusts are one of the commonest diseases of plant life and in the carnations it is caused by the fungus *Uromyces caryophyllinus,* one of the most serious diseases of this plant. *Darluca filum,* usually occurring in connection with this rust, is commonly considered as parasitic on the rust, but investigations seem to show it rather to be parasitic on the carnation. Plants affected by both the rust and *Darluca* are in worse condition than those affected only by the rust. The disease 'white legs' of the aster results in dwarfing, malformation and final decay. It is caused by nematode worms of the genus *Heterodera* or perhaps *Aphenenchus.* Leaf spot diseases, common in a great many plants, are caused by a number of different fungi.

(*b*) *Disturbed Transpiration.*—The rusts also cause a disturbance of the transpiration, which is usually the more destructive, due to the unguarded evaporation of water through the ruptures in the epidermis caused by the liberation of the spores. In carnations a disease called stigmonose is caused by the punctures of insects.

(*c*) *Interference with the Supply or Absorption of Water.*—The most destructive disease of this type is the aster wilt or stem rot. The characteristic effect is a wilting and a yellowish color first seen on one side of the plant, usually in one of the lower leaves. It is caused by the growth of a *Fusarium* fungus in the large water-carrying vessels, which are thus gradually clogged up. A more elaborate paper on this subject by Mr. Hargitt appears in the report of the Nebraska State Horticultural Society for 1903.

2. *Some Features of the Development of Flowering Plants:* Dr. J. E. Kirkwood.

The paper embodies the results obtained from the study of the embryology of about fifteen species of the Cucurbitaceæ. In all the forms examined the ovary begins by the invagination of a lateral shoot and the organs of the flower appear in the following order: sepals, petals, staminodia (when present) and carpels. In the early stages of embryonic growth the endosperm plays an important part by digesting the nucleus and nourishing the embryo.

3. *Bithynia tentaculata:* Albert J. May.

The gastropod *Bithynia tentaculata* was introduced into the United States from Europe and has become very abundant in New York. It was first noticed in this country in 1879, when specimens were taken simultaneously at Oswego and in the Champlain canal near Troy.

They seem to multiply and spread very rapidly. They are now reported from points all along the Hudson River and the Erie Canal. They are abundant in the Genesee and Niagara Rivers.